ELECTRONIC JEWELRY WITH DOWNLOADABLE IMAGES

by

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CROSS-REFERENCE TO RELATED APPLICATIONS

[01] This application claims the benefit of U.S. Provisional Patent Application No. 60/460,981, filed Apr. 8, 2003. This application further claims the benefit of U.S. Provisional Patent Application No. 60/490,618, filed Jul. 25, 2003. Both of these prior applications are assigned to the assignee of the present patent application and are incorporated herein by reference.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[02] The present invention relates generally to electronic jewelry, capable of viewing images and animations in an electronic display, and particularly to a system and a method for downloading various images and animations to such electronic jewelry directly from an electronic consumer device, or from a server connected to the electronic consumer device.

DESCRIPTION OF RELATED ART

[03] During the last few years, electronic jewelry became more and more popular. Unlike traditional jewelry, electronic jewelry incorporating light emitting, color changing and controlled components such as LEDs can produce dynamic effects, thus being more eye-catching.

[04] In the prior art, several patents describe jewelry items, such as pendants or watches, based on electrically controlled and generated light and color effects.

[05] US Patent no. **6238084** describes a wristwatch, comprising of a liquid crystal display, and a detachable bezel, wherein replacing the bezel causes a change of images appearing on the liquid crystal display.

[06] US Patent no. **20020070688** describes, among other consumer products a pendant, having a set of LEDs, controlled to change the order and the color of lighting.

[07] The electronic jewelry items described in the prior art do not benefit from the rich world of image data already existing for consumer devices such as personal computers and cellular phones, and the capabilities of these consumer devices to receive, change and create images and animations.

[08] Cellular phones become powerful almost as personal computers. The world of cellular communication brings more and more services, besides the traditional voice services: it offers web surfing through the cellular phone, download of ring tones, images and even short videos; built in organizers, and communication means to computers via data cables, infra red and blue tooth technology.

[09] Actually, the cellular phone has become an ornament by itself. Theoretically, it might be used as a pendant, displaying downloaded animations or images; practically, its basic functionality still requires dimensions that make it uncomfortable and heavy as a pendant.

[10] Personal computers are used for several years for connection to the Internet, and specifically for searching for and downloading image data to the PC hard disk, or to other devices. Such consumer device that can download data from a personal computer is the MP3 player, capable of playing music compressed in MP3 format.

BRIEF SUMMARY OF THE INVENTION

[11] The present invention provides an electronic ornament having the ability to download image data from a consumer device such as a cellular phone, or a personal computer, thus easily enabling an electronic ornament owner to download images and animations created by him, or received from network libraries. The electronic ornament of the present invention gives a person the ability to express himself in a dynamic manner; Its specific goal of the electronic ornament makes it compact enough to be useful and comfortable as an ornament; the connection to a consumer device, makes it very easy for the ornament owner to download new up-to-date images and animations.

[12] Unlike the electronic jewelry described in the prior art and existing in the market, the electronic jewelry provided by the present invention provides a novel way to bring the

richness of images and animations already existing in the world of personal computers and cellular phones to the world of jewelry.

[13] The present invention describes a system, where images and animations stored in content servers are transmitted in a compressed form via a network to a "mediator" – a cellular phone or a computer. After received by the mediator, they are decompressed to a set of images, which are sent to the electronic ornament, or first processed according to the user's directions and only afterwards sent to the electronic ornament. In this way, the existing high processing power of cellular phones and PCs is used to produce complicated animations, and the electronic ornament only stores the uncompressed images and displays them. This data flow enables the electronic ornament to be a cheap device, basically composed of memory, display and power supply.

[14] The electronic ornament can be simple and cheap as described above, or can be more sophisticated. A sophisticated electronic ornament can incorporate user interface for producing user control signals to manage its operation. Such sophisticated electronic ornament is also capable of receiving compressed images, decompress them and alter their size or view.

[15] Another aspect of the present invention is providing the cellular services providers on one hand, and animations creators on the other hand, a new business opportunity.

[16] Firms and organizations may also promote their products or ideas by using the present invention. In this case, users may download the animations for free, and the promoters will pay per download.

[17] It should be noticed, that the present invention might be used not only as jewelry but also for other purposes, such as an identification tag.

[18] It is a principal object of the present invention to provide a system, comprising of a consumer device having processing capabilities and incorporating communication means, and an ornament comprising of: a microprocessor, a memory for storing digital image data, a display for displaying selected image data from the memory, a receiver for receiving image data and storing it in the memory, and a battery for energizing the microprocessor, the display and the receiver; wherein a dedicated application in the consumer device is used for creating and changing images and animations, and then transmitting them to the ornament via a transmitter incorporated in the consumer device. The images and animations are stored in the ornament

memory for viewing them on the ornament display when desired, and according to received control data. Said consumer device may be a cellular phone, a personal computer, a PDA and such.

[19] It is still another object of the present invention to provide a system comprising of the consumer device and the ornament described above, and a server storing animations and images, said server able to get control signals and send data in response to control signals to consumer device via a cellular network. Said network may be a cellular network in case the consumer device is a cellular phone, and may be IP based network in case the consumer device is a personal computer. The consumer device owner activates an application in the consumer device to receive images and animations from the server via the network according to specified criteria; and after the images and animations are received by the consumer device, the user activates this application to optionally edit or alter these images, using image processing techniques, and transmits the images and animations from the consumer device to the ornament via the transmitter. It should be noticed that there might be an interactive session between the consumer device and the server, before the images are transmitted to the ornament.

[20] Additional features and advantages of the invention will become apparent from the following drawings and description.

[21] It should be noticed, that although the following drawings and description describe an electronic ornament shaped as a pendant, the electronic ornament of the present invention could be shaped also as a necklace, an earring, a bracelet etc.

BRIEF DESCRIPTION OF THE DRAWINGS

[22] The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

[23] **FIG. 1** schematically illustrates an electronic ornament, shaped as a pendant, in accordance with the present invention.

[24] **FIG. 2** shows a cross-section of the upper part of the pendant of **FIG. 1**.

[25] **FIG. 3** shows a cross-section of the lower part of the pendant of **FIG. 1**.

[26] **FIG. 4** shows a view of the sides of the pendant of **FIG. 1**.

[27] **FIG. 5** shows a view of the bottom of the pendant of **FIG. 1**.

[28] **FIGS. 6** and **7** are schematic block diagrams of the main modules comprising the pendant of **FIG. 1**, and of the pendant's interfaces. **FIG. 6** relates to a "sophisticated" pendant capable of storing compressed images and animations and decompressing them, and also capable of managing the timing of viewing the stored data. **FIG. 6** relates to a "simple" pendant, capable of storing uncompressed images and controlling only the timing of the viewing image.

[29] **FIG. 8** schematically illustrates a method for connecting the pendant of **FIG. 1** to a cellular phone, via a dedicated interface.

[30] **FIG. 9** is a schematic flow diagram illustrating the data flow in a system comprising a content server, a cellular phone and the pendant of **FIG. 1**.

[31] **FIG. 10** is a schematic flow diagram illustrating the data flow in a system comprising a content server, a personal computer and the pendant of **FIG. 1**.

[32] **FIG. 11** is a schematic flow diagram illustrating the main modules in the system described at **FIG. 9**.

[33] **FIG. 12** is a schematic flow diagram illustrating the data flow of producing in the cellular phone an animation based on images downloaded from a content server.

[34] **FIG. 13** is a schematic flow diagram illustrating the data flow of producing in the cellular phone an animated text, with embedded symbols.

[35] **FIG. 14** is a schematic flow diagram illustrating the data flow of producing an animation based on selected images, within the content server.

[36] **FIG. 15** is a schematic flow diagram illustrating the data flow of producing an animation based on photos taken by a camera embedded in the cellular phone.

[37] **FIG. 16** is a schematic flow diagram illustrating the data flow of producing an animation based on a set of animations downloaded from the content server.

[38] **FIG. 17** is a schematic flow diagram illustrating the data flow of receiving an animation sent by an owner of another cellular phone.

[39] **FIG. 18** is a schematic flow diagram illustrating the data flow of animation personalization.

[40] **FIGS. 19-21** are flow diagrams illustrating processes in a system wherein the pendant is a "sophisticated" pendant, as described above.

[41] **FIG. 19** is a schematic flow diagram illustrating the data flow of downloading an animation to the pendant using a cellular phone.

[42] **FIG. 20** is a schematic flow diagram illustrating the data flow of downloading an animation to the pendant using a personal computer.

[43] **FIG. 21** is a schematic flow diagram illustrating the data flow of selecting an animation to view from a set of animations stored in the pendant memory.

[44] **FIG. 22** schematically illustrates a method for connecting the pendant of **FIG. 1** to a personal computer, via a dedicated cradle.

[45] **FIG. 23** is a schematic flow diagram illustrating the data flow of downloading an animation to the pendant from a memory card holding animations, using the dedicated cradle of **FIG. 22**.

[46] **FIG. 24** is a schematic flow diagram illustrating the data flow of selecting an animation to view from a set of animations stored in the pendant memory.

[47] **FIG. 25** schematically illustrates a pendant, which can be attached to a cellular phone and become an integral part of it.

DETAILED DESCRIPTION OF THE INVENTION

[48] **FIG. 1** schematically illustrates a pendant, in accordance with the present invention. The pendant is comprised of a chain **101**, a case **102** containing electrical circuit and a display **103**, such as LCD, receiving signals from the electrical circuit and continuously viewing animations or images produced according to said signals. The case also holds a regular battery, or a rechargeable battery, for activating the electrical circuit. The pendant incorporates communication means, for downloading data to produce animations or images to be presented on the display. The pendant may also incorporate user interfaces such as buttons to control the pendant's operation.

[49] **FIG. 2** and **FIG. 3** are cross-sectional views of the pendant, describing the main electrical elements inside the pendant.

[50] **FIG. 2** schematically illustrates a cross-sectional view of the top of the pendant. Pendant case **201** incorporates a battery **202**, for operating the electrical circuit. Electronic components **203** and **204** are assembled on PCB **205**, and metal contacts **206** are used for electrically contacting the battery to the electrical circuit.

[51] **FIG. 3** schematically illustrates a cross-sectional view of the bottom of the pendant. Pendant case **301** incorporates LCD, comprising of the LCD glass **302**, LCD backlight **303**, and contacts **304** for passing signals from PCB **307** to the LCD glass. Bubble **306** covers the LCD glass to protect it from damage. PCB **307** lies under the LCD, and is a continuation of PCB **305** shown in **FIG. 2**. It integrates electronic components **308** and **309**.

[52] **FIG. 4** schematically illustrates buttons and slides, optionally located in the sides of the pendant's case **401**, for controlling its operation. Slide **402** has three modes: "Off", "On" and "Light". When "Off" mode is selected, the pendant is inactive. When "On" mode is selected, the pendant is operating. When "Light" mode is selected, the pendant is operating, and its display backlight is also operating.

[53] Button **403** is the "Select" button. It is used to select an image or an animation from a set of animations stored in the pendant memory. Button **404**, the "Set" button, is used for setting a selected animation to be displayed.

[54] It should be noticed that the user interface could vary from the one described in **FIG. 4**, and could be operated in other methods.

[55] **FIG. 5** is a view of the bottom of the pendant case **501**. Connection **502** is for charging the rechargeable battery inside the case. Elements **503** and **504** are two sets of metal contacts, for communicating up to two separate devices, as will be explained in details later.

[56] **FIG. 6** is a schematic block diagram including the main modules comprising a "sophisticated" version of the pendant of **FIG. 1**, and its interfaces to images and animations sources.

[57] Microprocessor **601** is responsible for managing the whole process and for controlling the rest of the modules. It is connected via interface **609** to external devices, such as a personal computer **602** or a cellular phone **603**, where the interface carries data and control signals between the pendant and the external devices. It may be noticed that the interface can be based on a cable, Infrared, blue tooth, WiFi or other types of connection methods.

[58] Microprocessor **601** stores animations received via interface **609** in flash memory **604**. The animations are in a compressed format, requiring a limited amount of memory for storing each of them, typically several tens of Kbytes. The compression may be in various formats, such as GIF, JPEG and others.

[59] Several types of animations, such as abstract animations, may also be represented as several sets of commands, each set for one image. When a command is executed it may direct the processor to create geometrical shapes in defined colors, move a shape created in the previous image to a new position inside the current image, or hold the presentation of the current image for a defined period of time.

[60] Flash memory **604** also holds the pendant application, executed by the microprocessor to achieve the full functionality of the pendant.

[61] When a specific animation is selected for display, microprocessor **601** de-compresses the compressed animation, and stores the de-compressed images in RAM **605**. If a set of animations is selected for continuous display, the de-compressed images are stored one after the other in RAM **605**. If the animation is in a "set of commands" format, the

microprocessor produces the set of images comprising the animation, and stores them in RAM **605**.

[62] During the mode of periodical display of animations, the images are retrieved from RAM **605** by the microprocessor, and are sent to LCD controller **606**. The fact that the animation is decompressed only once at the beginning of its periodical display, saves battery power and enables a longer time of usage for each battery charge.

[63] LCD controller **606** produces signals according to the images data sent by microprocessor **601**, causing LCD **607** to view the required image.

[64] User control signals received via interface **608** may direct the processor to change its mode of operation, for instance start viewing stored animations one after the other, or start viewing the current animation in a periodical manner.

[65] **FIG. 7** is a schematic block diagram including the main modules comprising a "simple" version of the pendant of **FIG. 1**.

[66] Personal computer **701** and Cellular phone **702** may send uncompressed images to electronic ornament **703**. The images are received through data interface **704** of the electronic ornament. Another type of data received by the electronic ornament may be timing data, defining the order and display time period of the images. Data transfer & timing control module **705** has two functionalities: store the received images at memory **706**, according to their predefined order; and retrieve the images from memory **706** for sending them to LCD controller **707**, according to the timing data.

[67] LCD controller **707** produces signals according to the images data sent by Data transfer & timing control module **705**, causing LCD **708** to view the required images.

[68] It should be noticed that Data transfer & timing control module **705** can be a microprocessor with limited functionality, or any kind of logic component such as ASIC or FPGA.

[69] **FIG. 8** schematically illustrates a method for connecting the pendant of **FIG. 1** to a cellular phone, via a dedicated interface.

[70] In order to receive data from cellular phone **802**, pendant **801** has a set of metal contacts **803**, capable of receiving data and transferring it to microprocessor **601** of **FIG. 6**. Pendant **801** also incorporates connector **804**, for charging its rechargeable battery from an external power source.

[71] Connector **805** is responsible for bi-directional communication between pendant **801** and cellular phone **802**, and for charging both pendant **801** and cellular phone **802**. Connector **805** incorporates for the communication purpose two sets of contacts, set **806** coupled to contacts **803** of the pendant and set **807** coupled to contacts **808** of cellular phone **802**. Contacts **806** and **807** are also coupled inside connector **805**, directly or via converter **809** and are used to convert, if required, the signals received from the cellular phone to the type of signals used by the pendant, and vice versa.

[72] Connector **803** is coupled to electricity source via transformer **810** and connector **811**. The power is directed to connector **812**, coupled to connector **804** of pendant **801**, and to connector **813** coupled to connector **814** of cellular phone **802**.

[73] **FIG. 9** schematically illustrates another method for connecting the pendant of **FIG. 1** to a cellular phone, via a dedicated interface.

[74] Pendant **902** receives data from cellular phone **901** via cable **903**. The same connector may be also used to charge pendant **902** by coupling it to the charging circuitry of cellular phone **901**. Connectors **904** and **905** are dedicated connectors, part of their pins used to pass data, and the rest for charging the pendant.

[75] **FIG. 10** is a schematic flow diagram illustrating the data flow in a system comprising a content server, a cellular phone and an electronic ornament.

[76] In such system, content server **1001** stores a database of categorized compressed images and animations. Cellular phone **1002** may contact content server **1001** via the cellular network, and retrieve a set of images and/or animations, their attributes or their minimized versions. After retrieving the images or the animations, cellular phone **1001** decompresses them, and may also perform image-processing actions according to the user's selection, to create a new animation. The set of uncompressed images is then sent to electronic ornament **1003** via any type of communication means such cable, IR or blue tooth.

[77] **FIG. 11** is a schematic flow diagram illustrating the data flow in a system comprising a content server, a personal computer and an electronic ornament.

[78] The system described at Fig.**11** is similar to the system described at **FIG. 10**, where personal computer **1102** takes the role of cellular phone **1002** of **FIG. 10**. Personal computer **1102** may communicate with content server **1101** via the Internet or any other network. The communication of personal computer **1102** with electronic ornament **1103** may be done via any of the communication means mentioned regarding **FIG. 10**.

[79] **FIG. 12** is a schematic flow diagram illustrating in more details the data flow at the system described at **FIG. 10**.

[80] Content server **1201** holds a database **1202** of compressed images and animations. As mentioned above, it may also store attributes of these images and animations, and minimized versions of them.

[81] Following the interaction of the cellular phone owner with the application at content server **1201**, cellular phone **1203** receives a set of images and/or animations. First they are decompressed at de-compressor **1204**. Afterwards, the images may be sent to memory **1206** and then to electronic ornament **1207**. The user may also perform image-processing algorithms to produce a new animation from the original set of images and/or animations. The images composing the new animation are also sent to memory **1206**, and then via one of the communication means described above, to electronic ornament **1207**.

[82] Uncompressed images received at electronic ornament **1207** are stored at memory **1208**, and sent to the LCD controller to produce viewable images.

[83] **FIG. 13 – 19** are a set of schematic flow diagrams illustrating possible data flows in the system described at **FIG. 10**. These flow diagrams describe the actions of the owner of a cellular phone and an electronic ornament, and how they influence the applications residing at the cellular phone and the content server.

[84] **FIG. 13** is a schematic flow diagram illustrating the data flow of producing an animation based on images downloaded from a content server to a cellular phone.

[85] The user first activates the "Electronic jewelry" application ("the application") residing at the cellular phone. Then he chooses the "Category" item at an options list viewed to

him by the application (block **1301**). The application contacts the content server and asks for an updated list of animations and images categories (block **1302**). The content server transmits as an answer the list of categories names (block **1303**).

[86] The user chooses a category from the list, specifying that he is interested in images (block **1304**), and the application asks the content server for a list of the images contained in the chosen category (block **1305**). The content server transmits a set of minimized relevant images (block **1306**). The user then selects a subset of the viewed images (block **1307**); the application asks the content server for the full images of the selected subset (block **1308**). The content server returns the required set of images (block **1309**).

[87] The user then selects in the application an effect from a list of possible effects. This effect defines the way the chosen images will be replaced one by the other. Such effects may be fade, dissolve, swivel and so on (block **1310**). The user may also define the period of time each image will appear until replaced by the next image. The application activates the image-processing module to create an animation with the required effect (block **1311**).

[88] The "Electronic jewelry" application at the cellular phone also manages the sequencing and timing of the set of images stored in the memory of the electronic ornament. The user can view the current sequence ("Timing list") of the stored animations and their timing, and choose when to schedule the new animation within that sequence (block **1312**). The user may also define how many times the animation will be repeated, and define an idle time between two consequent animations, for power saving purpose. The application updates the timing list of the electronic ornament (block **1313**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1314**).

[89] **FIG. 14** is a schematic flow diagram illustrating the data flow of producing an animation based on a phrase written by the user, and a symbol embedded in it. An example for it may be the phrase "I love NY", where the word "love" is expressed by a symbol (image or animation) of a heart.

[90] The user first activates the "Electronic jewelry" application at the cellular phone. Then he chooses the "Animated symbols" item at an options list viewed to him (block **1401**). The application contacts the content server and asks for a list of animated symbols (block **1402**). The content server transmits as an answer a set of minimized relevant symbols (block **1403**).

The user chooses a subset of the viewed symbols (block **1404**); the application asks the content server for the full images or animations of the selected subset (block **1405**). The content server returns the required set of compressed images or symbols (block **1406**), and they are saved in the memory of the cellular phone (block **1407**).

[91] Later on, the user activates again the "Electronic jewelry" application at the cellular phone. Then he chooses the "Text effects" item at an options list viewed to him (block **1408**). The application views to him a list of possible effects, such as "wave" etc. (block **1409**); The user chooses a desired effect, writes a phrase and embed a symbol from the set of symbols stored earlier in the memory of the cellular phone (block **1410**).

[92] The application activates the image-processing module to create an animation with the chosen effect (block **1411**). The user updates the timing list of the electronic ornament (block **1412**). The application saves this update (block **1413**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1414**).

[93] **FIG. 15** is a schematic flow diagram illustrating the data flow of producing an animation by the content server, based on images stored in the database of the content server, according to the definitions of the user.

[94] The initial steps are much alike the steps described for **FIG. 13**. The user first activates the "Electronic jewelry" application at the cellular phone. Then he chooses the "Category" item at an options list viewed to him (block **1501**). The application contacts the content server and asks for an updated list of animations and images categories (block **1502**). The content server transmits as an answer the list of categories names (block **1503**).

[95] The user chooses a category from the list (block **1504**), and the application asks the content server for a list of the items contained in the chosen category (block **1505**). The content server transmits a set of minimized relevant images (block **1506**), and the user then selects a subset of the viewed images (block **1507**).

[96] The user then selects in the application an effect from a list of possible effects (block **1508**). Unlike in the flow diagram of **FIG. 13**, the image processing is taking place in the content server. The application sends to the content server the subset of selected images and the chosen effect. An image-processing module within the content server creates a compressed

animation due to the chosen images and effect (block **1510**), and transmits it to the cellular phone (block **1511**).

[97] The application decompresses the compressed animation (block **1512**). The user updates the timing list of the electronic ornament (block **1513**). The application saves this update (block **1514**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1515**).

[98] **FIG. 16** is a schematic flow diagram illustrating the data flow of producing an animation, based on photos that were taken by the owner of a cellular phone having an integrated camera.

[99] In this case, the content server is not part of the process. The user activates the "Electronic jewelry" application at the cellular phone and chooses the "Photos" item at an options list viewed to him (block **1601**). The application views to the user a set of minimized photos that were saved before by the user in the memory of the cellular phone (block **1602**). The user chooses an ordered list of photos (block **1603**), and the required transition effect (block **1604**). The application activates the image-processing module to create an uncompressed animation with the required effect (block **1605**). The user updates the timing list of the electronic ornament (block **1606**). The application saves this update (block **1607**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1608**).

[100] **FIG. 17** is a schematic flow diagram illustrating the data flow of producing an animation based on a set of animations downloaded to a cellular phone from a content server.

[101] The user first activates the "Electronic jewelry" application at the cellular phone. Then he chooses the "Category" item at an options list viewed to him (block **1701**). The application contacts the content server and asks for an updated list of animations and images categories (block **1702**). The content server transmits as an answer the list of categories names (block **1703**).

[102] The user chooses a category from the list (block **1704**), and the application asks the content server for a list of animations contained in the chosen category (block **1705**). The content server transmits a set of minimized relevant animations (block **1706**). The user then selects a subset of the viewed animations (block **1707**); the application asks the content server

for the full animations of the selected subset (block **1708**). The content server returns the required set of images (block **1709**).

[103] The application decompresses the received set of animations to one sequence of images (block **1710 - 1711**). The user updates the timing list of the electronic ornament (block **1712**). The application saves this update (block **1713**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1714**).

[104] **FIG. 18** is a schematic flow diagram illustrating the data flow of receiving an animation from another owner of a cellular phone, and transmitting it to the electronic ornament.

[105] The cellular phone updates the application that it received a new animation sent by another cellular phone (block **1801**). The application views the animation to the user (block **1802**), to decide if he wishes to download the animation to the electronic ornament. If the user decides to load the animation (block **1803**), the application decompresses the received animation (block **1804**), and creates a set of images (block **1805**) to be downloaded by the electronic ornament. The user updates the timing list of the electronic ornament (block **1806**). The application saves this update (block **1807**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1808**).

[106] **FIG. 19** is a schematic flow diagram illustrating the data flow of a process where a user is being recommended what animation to download to the electronic ornament for a specific occasion.

[107] The user activates the "Electronic jewelry" application at the cellular phone, and chooses the "Consultant" item at an options list viewed to him (block **1901**).

[108] The application interacts with the user, guiding him to supply details such as the type of the occasion, what the user plans to wear in that occasion and so on (block **1902**). After the user answers these questions (block **1903**), the application sends to the content server a list of attributes reflecting the answers of the user (block **1904**).

[109] The database at the content server also holds a set of attributes logically connected to each of the images and animations stored in it. When the application request is received, its attributes are matched to the attributes stored at the database of the content server; a

set of minimized animations is prepared for the set of animations which their attributes match the attributes of the request and this set is sent back to the application (block **1905**).

[110] The user then selects a subset of the viewed images (block **1906**); the application asks the content server for the full images of the selected subset (block **1907**). The content server returns the required set of images (block **1908**).

[111] The application decompresses the received set of minimized animations to a sequence of images (block **1909 - 1910**). The user updates the timing list of the electronic ornament (block **1911**). The application updates the timing list of the electronic ornament (block **1912**), and sends the set of produced images and the updated timing list to the electronic ornament (block **1913**).

[112] **FIG. 20** is a schematic flow diagram illustrating the data flow of downloading an animation to a "sophisticated" pendant using a cellular phone. It focuses on operations made by the processor of the cellular phone and by microprocessor **601** of the pendant.

[113] As described in block **2001**, the user initializes the process by choosing the item "Electronic jewelry" application from the set of applications available to him in his cellular phone. It is assumed that this application is loaded into the cellular phone memory over the air, or pre-loaded by the cellular service provider.

[114] The cellular phone views a menu of possible actions, regarding the chosen "Electronic jewelry" application. The user selects "Download animations" from the menu (block **2002**).

[115] The processor of the cellular phone, via the equipment of the cellular service provider, establishes a connection to a dedicated server, holding a large set of animations. The animations may be viewed in the cellular phone display by categories, by icons and so on (block **2003**). This technique of connecting cellular phones to the Internet and other networks is well known and in use for several time.

[116] The user then browses the animations viewed on the display of the cellular phone, and selects the one he wants to download (block **2004**).

[117] The processor of the cellular phone receives the user request, and downloads the selected animation to the cellular phone memory (block **2005**). Other mechanisms of the cellular

service provider, such as a billing mechanism may be involved, crediting the user for the download action.

[118] When the user wishes to download the animation stored in the cellular phone memory to the pendant, he should first connect the cellular phone to the pendant via the dedicated connector **805** of **FIG. 8** (block **2006**). Then the user chooses in the "Pendant animations " menu the item "Load to pendant" (block **2007**).

[119] When receiving the user's request, the cellular phone processor connects the pendant microprocessor **601** via connector **805**, and asks if there is enough space in flash memory **604** of the pendant for the requested animation (block **2008**).

[120] Microprocessor **601** of the pendant checks if there is enough memory in flash memory **604**; If there is not enough memory, a negative answer is returned to the cellular phone processor (block **2009**). The cellular phone processor views on the display of the cellular phone a message saying so (block **2010**), and the user will have to free some memory by removing an older animation.

[121] If there is enough free memory, Microprocessor **601** increments by one the "Total animations" register which keeps an updated total amount of animations. Microprocessor **601** also activates a process defining an address in flash memory **604** where the animation can be stored (block **2011**). Preferably, the process keeps a contiguous memory space for each animation, to avoid memory segmentation issues.

[122] The start address of the animation in flash memory **604** is saved by microprocessor **601** in "Start addresses" table (block **2012**). "Start addresses" table is sequential, and the start address of an animation can be retrieved from it by the animation index. Then, a positive answer is returned to the cellular phone processor, and the cellular phone processor sends the stored animation to the pendant microprocessor **601** via connector **705** (block **2013**). The animation is stored at the defined address (block **2014**).

[123] **FIG. 21** schematically illustrates a method for connecting the pendant of **FIG. 1** to a personal computer **2105**, via a dedicated cradle **801**.

[124] Cradle **2101** has two slots – one slot for holding pendant **2102**, and the second slot for holding either memory card **2103** or memory card **2104**.

[125] Cradle **2101** may also include some electronic circuit, used to convert signals transferred between pendant **2102** and personal computer **2105**. Connector **2106** is a standard connector used in personal computers, such as USB connector. Transformer **2107** supplies power to the cradle for charging pendant **2102**, and for operating the cradle electrical circuit, if exists.

[126] When pendant **2102** is inserted into the matching slot of the cradle, its microprocessor **601** is capable of contacting both the personal computer **2105** and an inserted memory card, via contact sets **303** and **304** located at the bottom of pendant **2102**.

[127] Memory card **2103** holds a unique code number, and is used to allow a pre-defined number of actions of downloading animations to pendant **2102**. Pendant **2102** is capable of retrieving this code number from memory card **2103** via the cradle circuit and sending it to personal computer **2105**. Personal computer **2105** is connected via the Internet to a dedicated server, storing images and animations data and managing download operations. Said server, decides according to the received unique code number if the download of the animation should be allowed or denied.

[128] Memory card **2104** holds a set of animations. When inserted into the matching slot of the cradle, microprocessor **601** can contact it via the circuit of the cradle, and move the stored animation to flash memory **604** of the pendant.

[129] Microprocessor **601** can distinguish between the two types of memory card by a specific contact in the set of contacts located on the cards, which is electrically set to "**0**" in one type of the cards, and to "**1**" in the other type. Reading this value directs microprocessor **601** how to react.

[130] **FIG. 22** is a schematic flow diagram illustrating the data flow of downloading an animation to the pendant using a personal computer. This flow diagram is much alike the previous one illustrated at **FIG. 20**.

[131] A preliminary action for this flow diagram is the installation of a "Electronic jewelry" application in the personal computer. This application is capable of contacting via a network an "Animations server", holding the animations as files, animation cards code numbers, a billing system and other related data. The application can view to the user animations stored in

the "Animations server" memory, so the user will be able to specify the animations he would like to download.

[132] The "Electronic jewelry" application is also capable of contacting a pendant microprocessor **601** via connector **2106** of the cradle **2101**. As mentioned before, the connection is bi-directional and is used for data transfer and for control as well.

[133] The "Electronic jewelry" application may also include an animation editor, where the user is able to create animations of his own, for downloading them to the pendant.

[134] As described in block **2201**, the user initializes the process by activating the "Electronic jewelry" application previously installed in the personal computer.

[135] The application establishes a network connection to the "Animations server", and views its home page on the display of the personal computer (block **2202**).

[136] The user then browses the animations viewed on the display of the personal computer, and selects the one he wants to download (block **2203**).

[137] When receiving the user's request, the "Electronic jewelry" application connects pendant microprocessor **601** via connector **2106**, and asks for a code number of an animation download card **2103** (block **2204**).

[138] Microprocessor **601** of the pendant reads via the circuit of cradle **801** the code number of an inserted animation download card, and sends it back to the "Electronic jewelry" application (block **2205**).

[139] The "Electronic jewelry" application on the personal computer sends the code number to the "Animations server". The last one checks how many downloads are still available for this code number. If there are any, the "Animations server" sends a download confirmation to the "Electronic jewelry" application, and decrements by one the number of remaining downloads for this code number; If no downloads remained, or the code number is invalid, it returns a negative answer (block **2206**).

[140] The "Electronic jewelry" application checks the answer (block **2207**): if it was negative, a proper message is viewed to the user on the personal computer display (block **2208**);

If the answer was positive, the "Electronic jewelry" application asks microprocessor **601** to check if there is enough free memory space for storing the new animation (block **2209**).

[141] Microprocessor **601** checks if there is enough memory in flash memory **604** (block **2210**); if there is not enough memory, a negative answer is returned to the "Electronic jewelry" application. The application views on the display of the personal computer a message saying so (block **2211**), and the user will have to free some memory by removing an older animation.

[142] If there is enough free memory, Microprocessor **601** increments by one the "Total animations" register which keeps an updated total amount of animations. Microprocessor **601** also activates a process defining an address in flash memory **604** where the animation can be stored (block **2212**). Preferably, the process keeps a contiguous memory space for each animation, to avoid memory segmentation issues.

[143] The start address of the animation in flash memory **604** is saved by microprocessor **601** in "Start addresses" table (block **2213**). A stored animation start address can be retrieved from the "Start addresses" table by its index. Then, a positive answer is returned to the "Electronic jewelry" application. The application downloads the required animation from the "Animations server", and sends it to pendant microprocessor **601** (block **2214**). The animation may be optionally saved on the local disk of the personal computer, for backup purposes. The animation is received by microprocessor **601** and stored at the defined address of flash memory **604** (block **2215**).

[144] **FIG. 23** is a schematic flow diagram illustrating the data flow of downloading an animation to the pendant from a memory card holding animations.

[145] The user first inserts the pendant into its matching slot in cradle **2101** (block **2301**). Then the user inserts animations memory card **2104** to its matching slot in cradle **2101** (block **2302**).

[146] Pendant microprocessor **601** periodically detects the existence of animations memory card **2104** in its matching slot (block **2303**). When the card is detected, pendant microprocessor **601** views a message on the pendant's display **607**: "Download started" (block **2304**), and downloads the whole content of the animations memory card to the flash memory of

the pendant **604**. An interactive process may be in use at this stage asking the user if he agrees to remove old animations to free space for new ones, if required (block **2305**).

[147] At the end of the process, pendant microprocessor **601** views a message on the pendant's display **607**: "Download completed" (block **2306**).

[148] **FIG. 24** is a schematic flow diagram illustrating the data flow of selecting an animation to view from a set of animations stored in pendant flash memory **604**.

[149] Slide **202** of **FIG. 2** is moved from "Off" mode to "On" mode, to activate the pendant circuit (block **2401**). Pendant microprocessor **601** initializes register "Animations counter" to zero (block **2402**). Register "Animations counter" is then incremented by one; if it exceeds the current value of "Total animations" register, it is set to **1** (block **2403**). Microprocessor **601** gets from the addresses table the start address related to the current value stored at "Animations counter" register (block **2404**). Then microprocessor **601** reads the animation starting at this start address in flash memory **604**, and uses the proper algorithm to de-compress it. A special header may identify the type of the compression with a unique identifier for each type (block **2405**).

[150] Microprocessor **601** sends the de-compressed animation to be stored in RAM **605** (block **2406**). From now on, Microprocessor **601** periodically sends the animation stored at RAM **605** to LCD controller **606**, to be displayed on LCD **607** (block **2407**).

[151] As described above, after power startup the pendant will start viewing periodically the first animation stored in flash memory **604**. When the pendant's owner wishes to select an animation from the set of stored animations, he should press the select button repeatedly, until he sees the animation he wants on the LCD (blocks **2408 – 2410**). Each press on the button increments "Animations counter" register by one (block **2403**), and is followed by the activation of the whole process described in blocks **2403** to **2407**.

[152] It should be noticed that the user may control the sequence of viewed animations, the delay between two animations and other viewing parameters by the pendant's buttons and slides, or by other types of user interfaces such as "touch screen" type LCD.

[153] **FIG. 25** includes three figures: **25a**, **25b** and **25c**, schematically illustrating a pendant, which can be attached to a cellular phone and become an integral part of it.

[154] In order to eliminate the need for special connector between the pendant and a cellular phone, as described in **FIG. 8** and **FIG. 9**, a dedicated cellular phone can be formed, capable of holding the pendant in a holder, where the holder is an integral part of the cellular phone. Whenever the user wishes to wear the pendant, he should detach the pendant from the cellular phone.

[155] Whenever pendant **2505** is attached to cellular phone **2503**, images and animations can be transmitted directly to the pendant when received by the cellular phone from the cellular network, to be stored in the pendant's flash memory. The process of downloading images or animations is much alike the process described in **FIG. 20**, without the need to use the connector, and without the need to temporarily store the downloaded data in the cellular memory.

[156] When the pendant is attached to the cellular phone, it can be also used as an integral part of the cellular phone for viewing information such as the details of a calling person, or time and date to the user. In this mode, the processor of the cellular phone transmits the relevant data to the processor of the pendant, for viewing it on the LCD.

[157] **FIG. 25a** is an illustration of a cellular phone **2501**, having two folders connected by a hinge. The upper folder incorporates display **2502**.

[158] **FIG. 25b** is a front view of the cellular phone **2503** when closed. Holder **2504** is an integral part of the cellular phone. In its bottom it has a set of connectors, used for passing control signals and data signals between the processor of the cellular phone and the processor of pendant **2505**. The connectors inside the holder are also used to charge the pendant's rechargeable battery **202**, as described in **FIG. 2**, while the cellular phone is charged. Necklace **2506** is connected to pendant **2505**, also when attached to the cellular phone.

[159] **FIG. 25c** is a side view of the cellular phone **2507** when closed. Holder **2508** holds pendant **2509**, and the pendant becomes an integral part of the cellular phone.

[160] While the invention has been described with respect to a limited number of embodiments, it will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described herein. Rather the scope of the present invention includes both combinations and sub-combinations of the various features

described herein, as well as variations and modifications which would occur to persons skilled in the art upon reading the specification and which are not in the prior art.